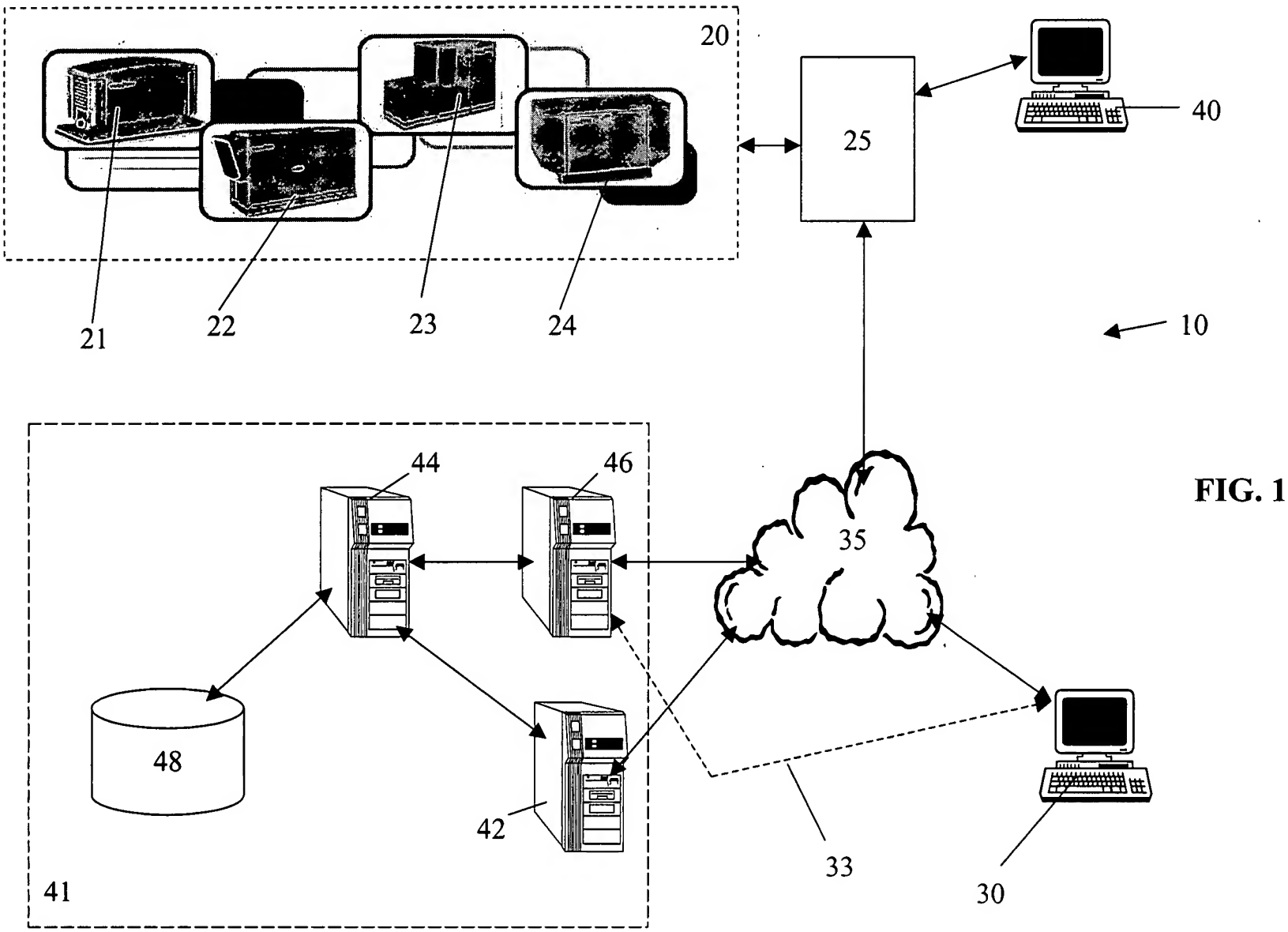


FIG. 1

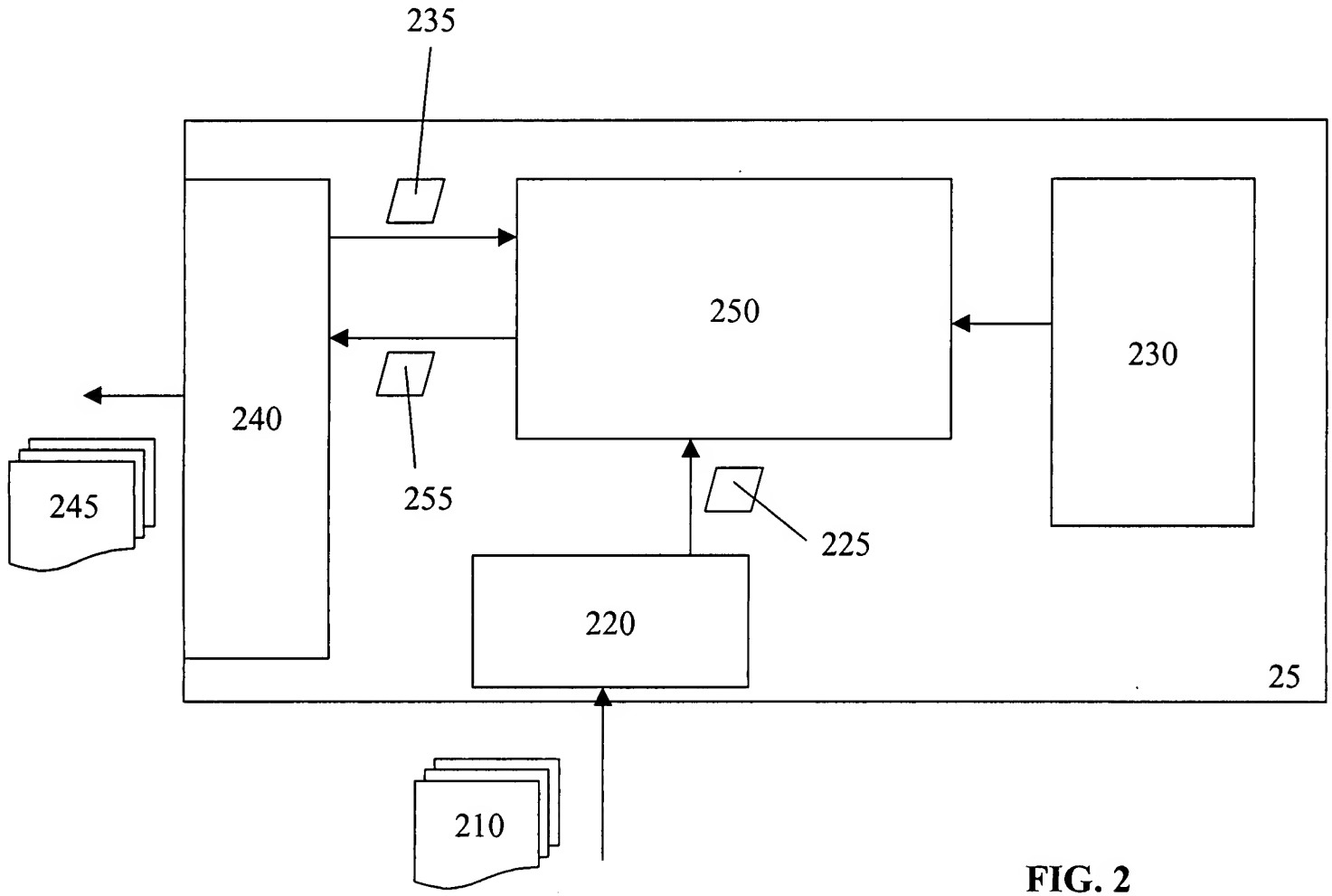


FIG. 2

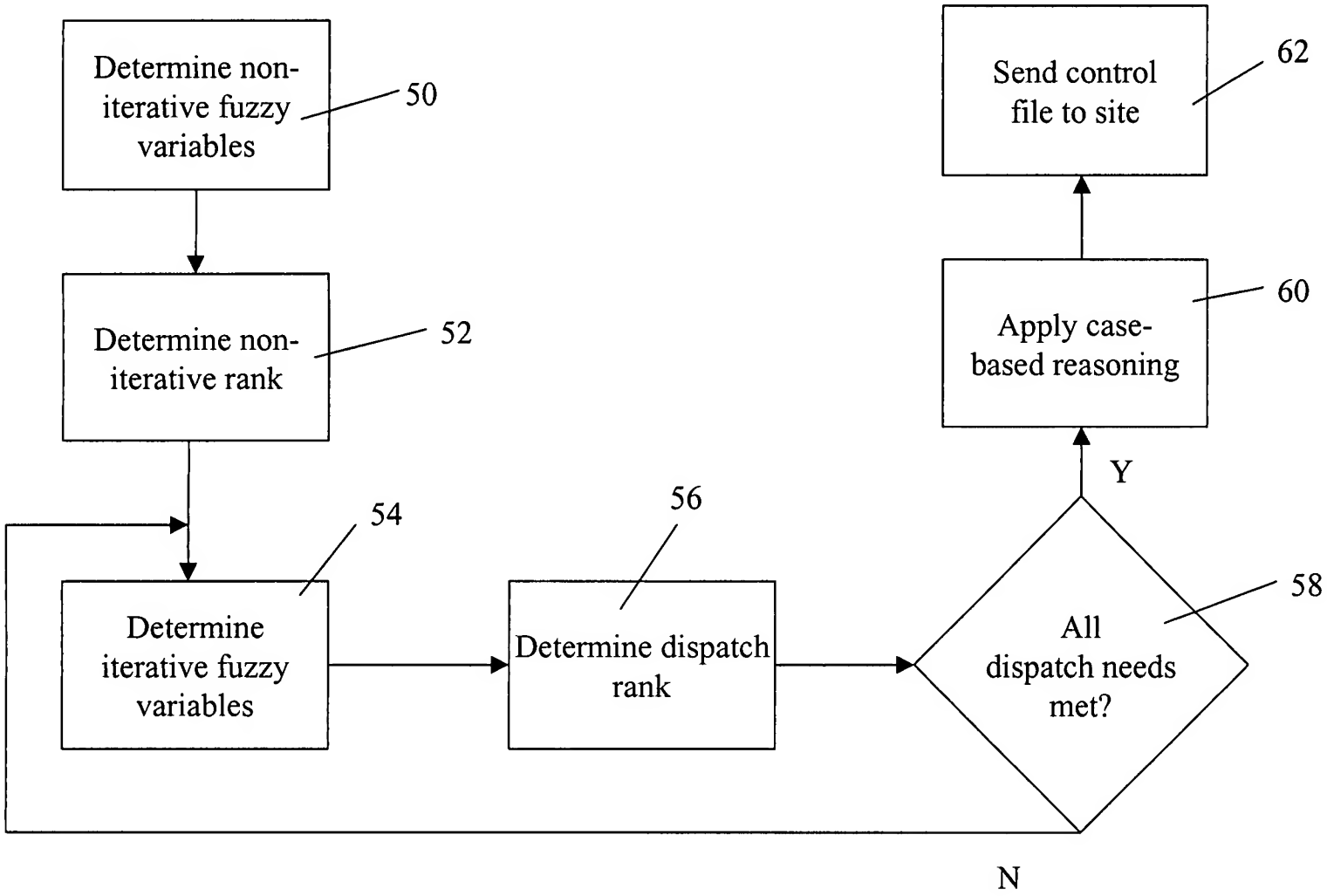

Determine non-iterative fuzzy variables
50
Determine non-iterative rank
52
Determine iterative fuzzy variables
54
Determine dispatch rank
56
All dispatch needs met?
58
Y
N
Apply case-based reasoning
60
Send control file to site
62

FIG. 3

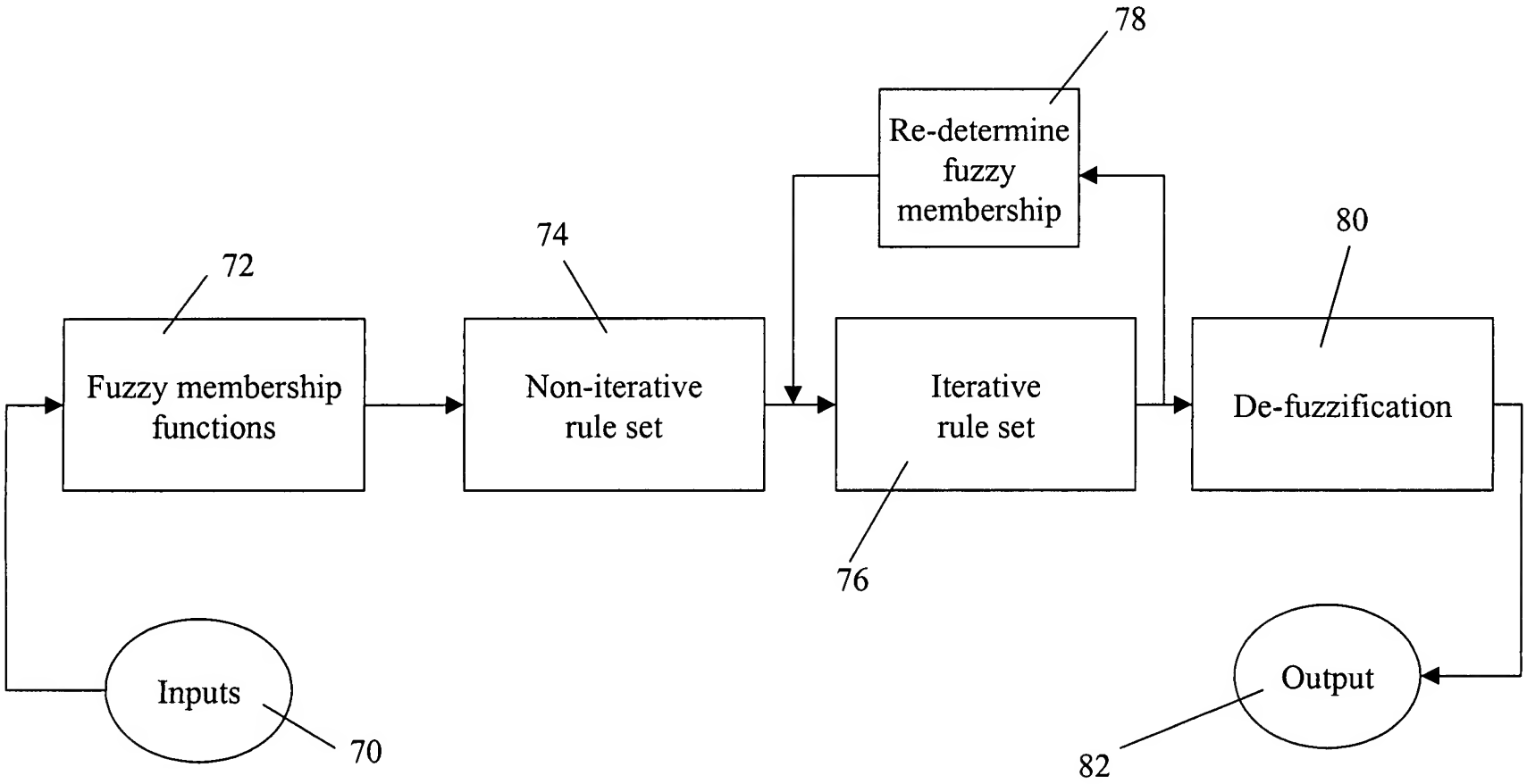

78
Re-determine fuzzy membership
74
80
72
Fuzzy membership functions
Non-iterative rule set
Iterative rule set
De-fuzzification
76
Inputs
70
Output
82

FIG. 4

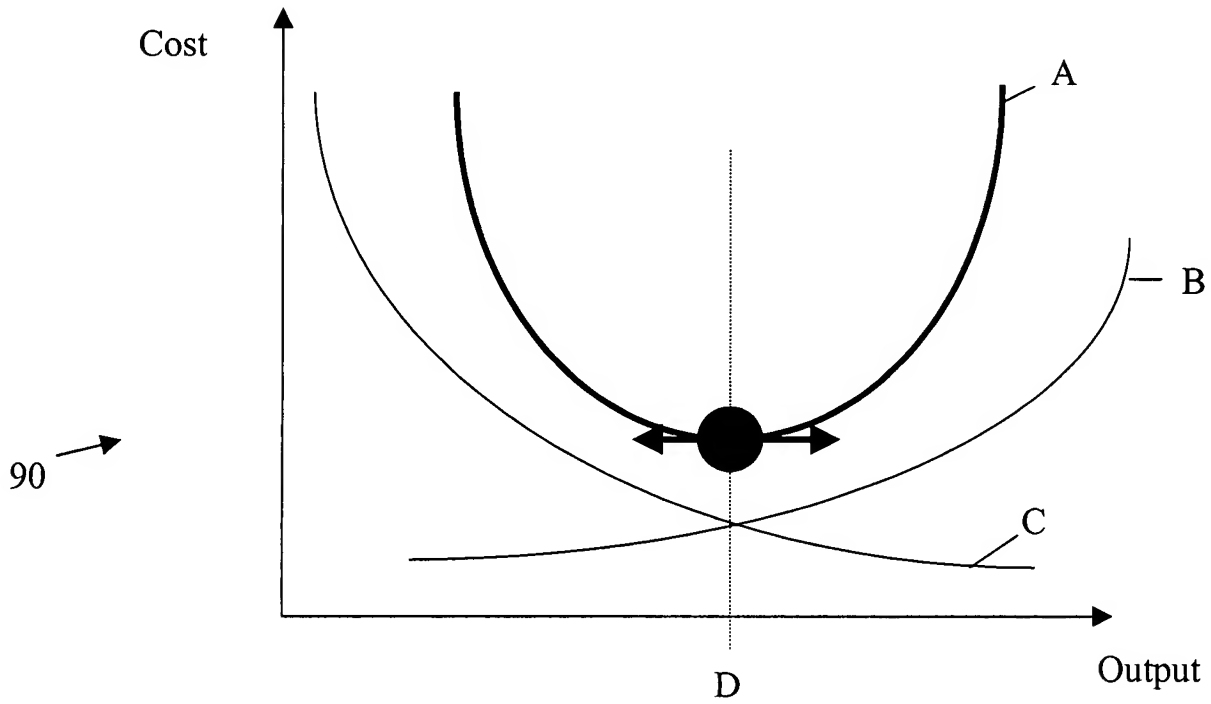


FIG. 5

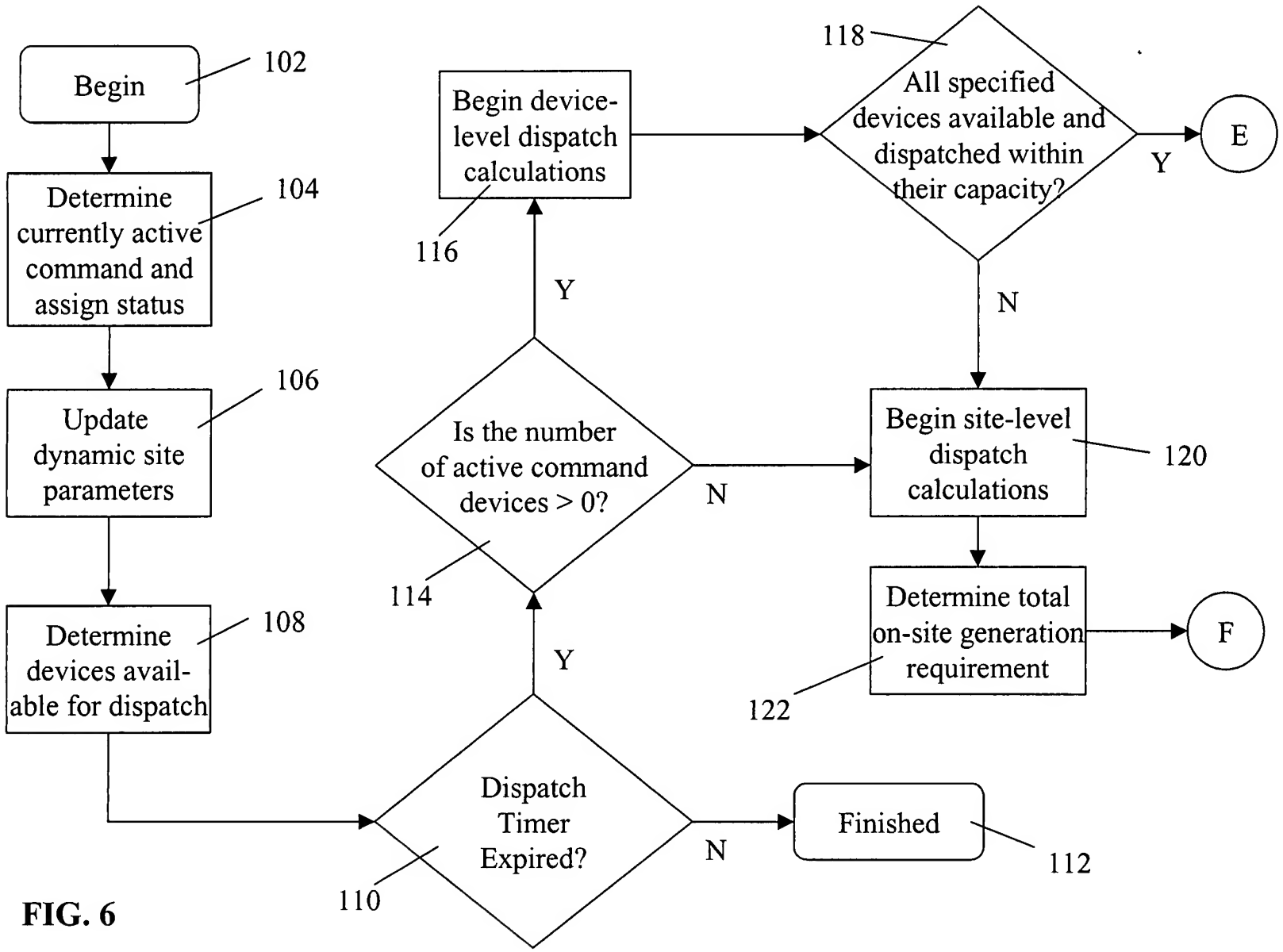

Begin
102
Determine currently active command and assign status
104
Update dynamic site parameters
106
Determine devices available for dispatch
108
Dispatch Timer Expired?
110
N
Finished
112
Y
Is the number of active command devices > 0?
114
N
Begin site-level dispatch calculations
120
Determine total on-site generation requirement
122
F
Y
Begin device-level dispatch calculations
116
All specified devices available and dispatched within their capacity?
118
Y
E
N

FIG. 6

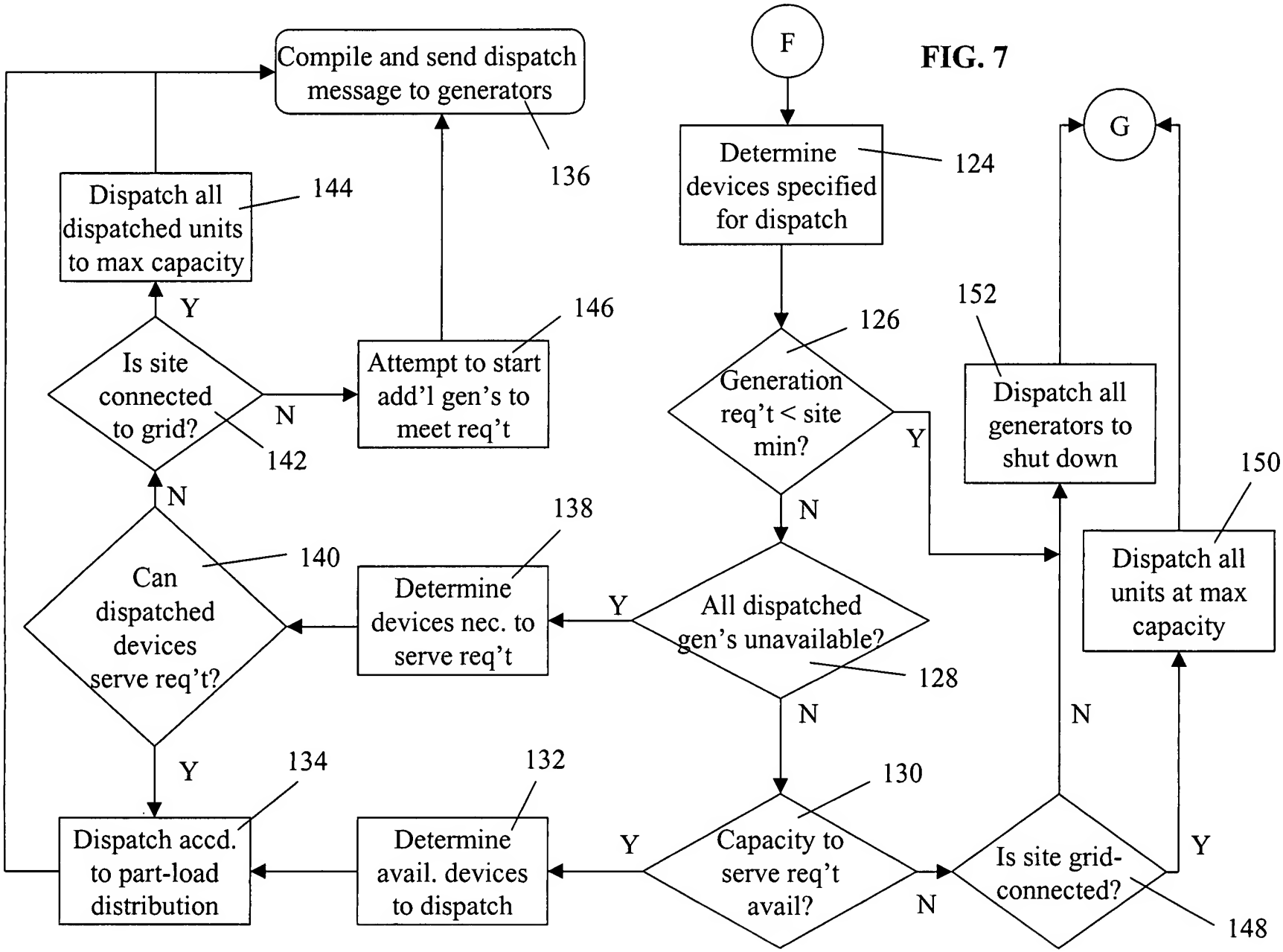
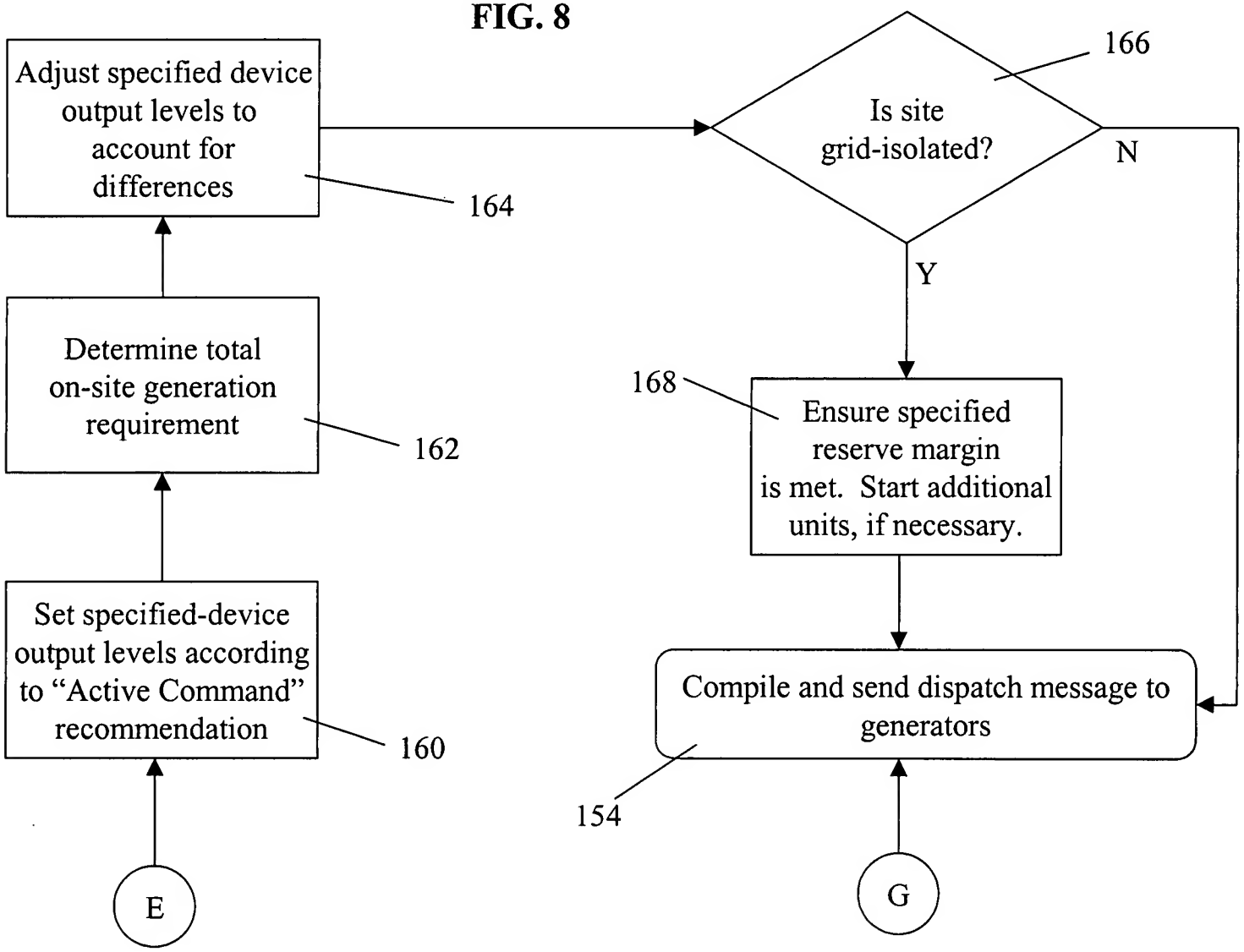

F
Compile and send dispatch message to generators
136
Dispatch all dispatched units to max capacity
144
Y
Is site connected to grid?
142
N
Attempt to start add'l gen's to meet req't
146
N
Can dispatched devices serve req't?
140
Y
Dispatch accd. to part-load distribution
134
Determine avail. devices to dispatch
132
Y
Capacity to serve req't avail?
130
N
Determine devices nec. to serve req't
138
Y
All dispatched gen's unavailable?
128
N
Determine devices specified for dispatch
124
Generation req't < site min?
126
Y
N
Dispatch all generators to shut down
152
G
Dispatch all units at max capacity
150
Is site grid-connected?
148
Y
N
N

FIG. 7

FIG. 8


Adjust specified device output levels to account for differences
164
Is site grid-isolated?
166
N
Y
Determine total on-site generation requirement
162
168
Ensure specified reserve margin is met. Start additional units, if necessary.
Set specified-device output levels according to "Active Command" recommendation
160
Compile and send dispatch message to generators
154
E
G

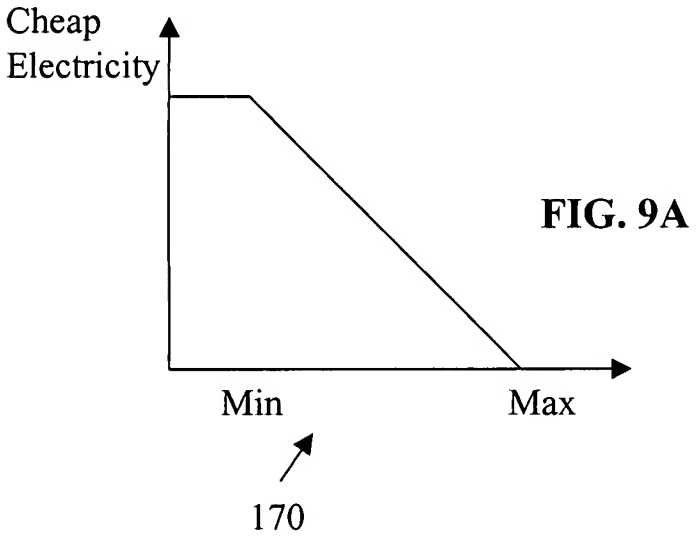


FIG. 9A

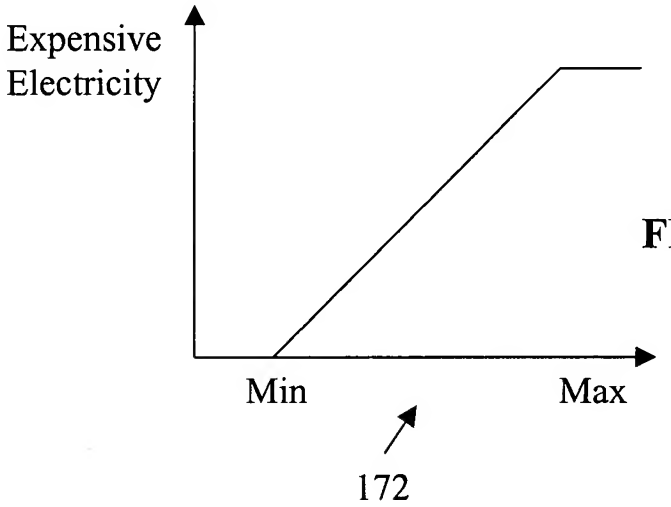


FIG. 9B

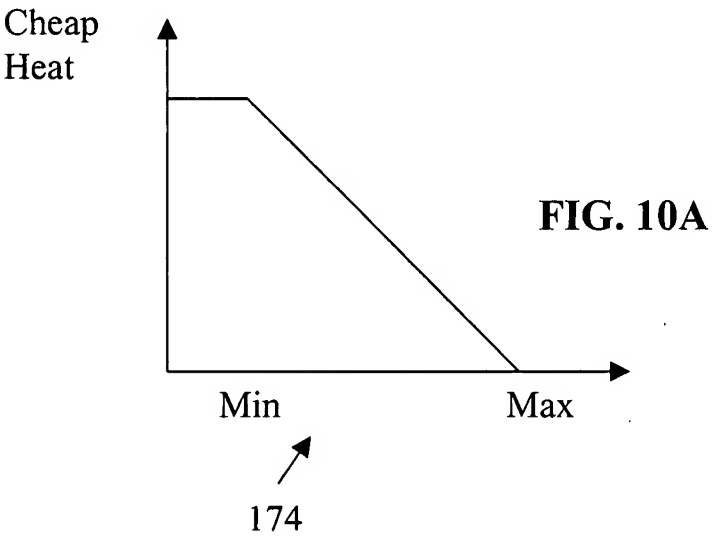


FIG. 10A

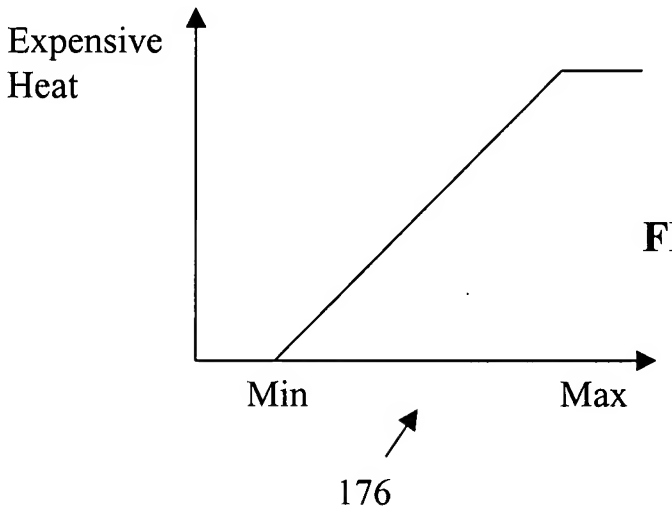


FIG. 10B

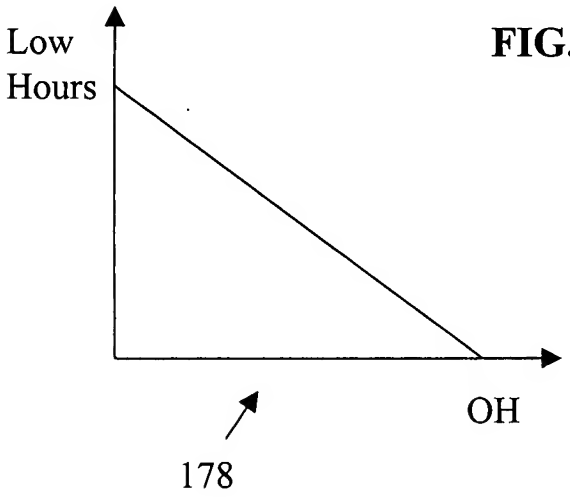


FIG. 11A

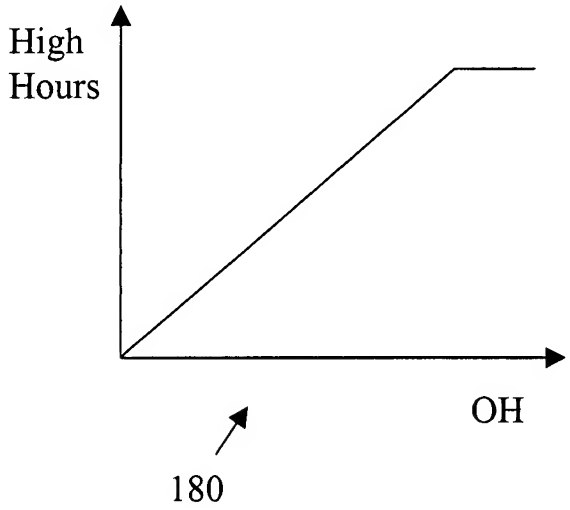


FIG. 11B

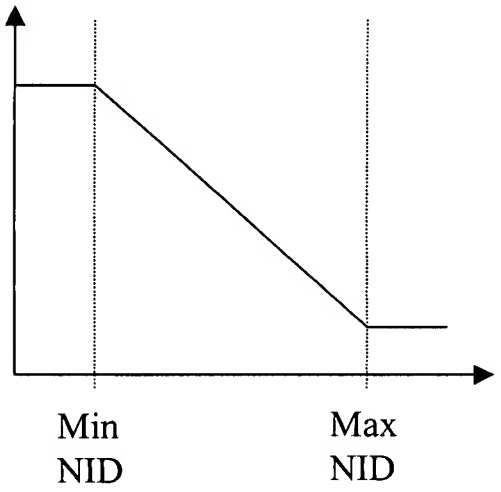


FIG. 12

182

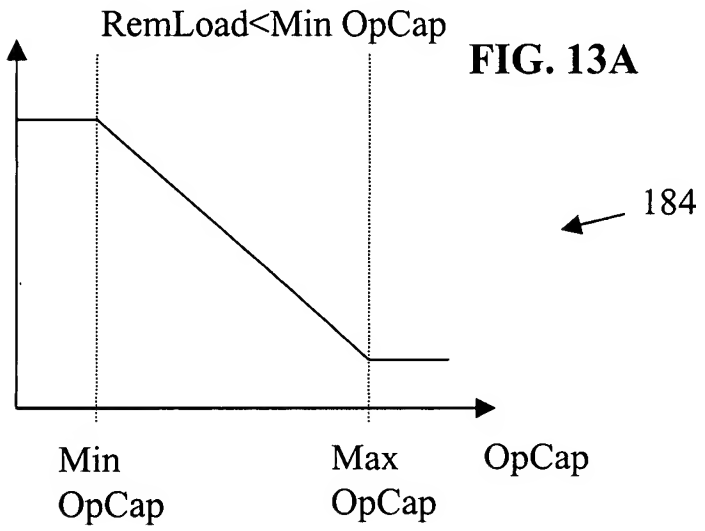


FIG. 13A

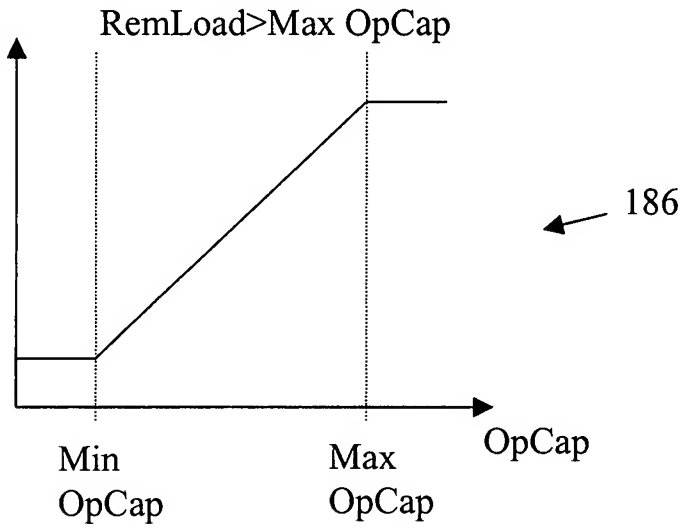


FIG. 13B

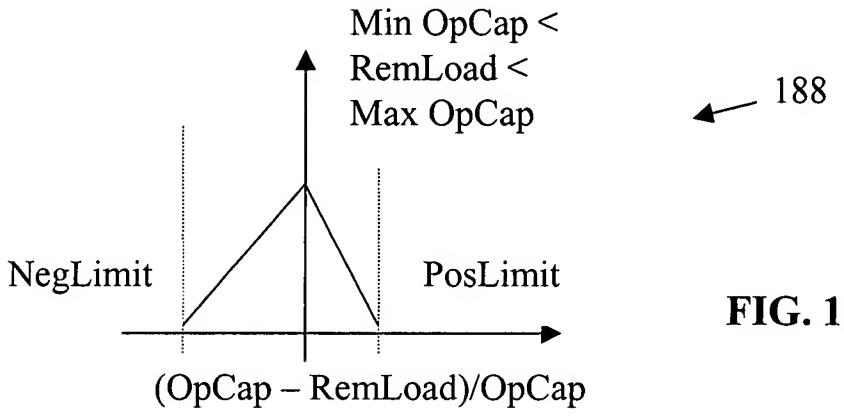


FIG. 13C

FIG. 14

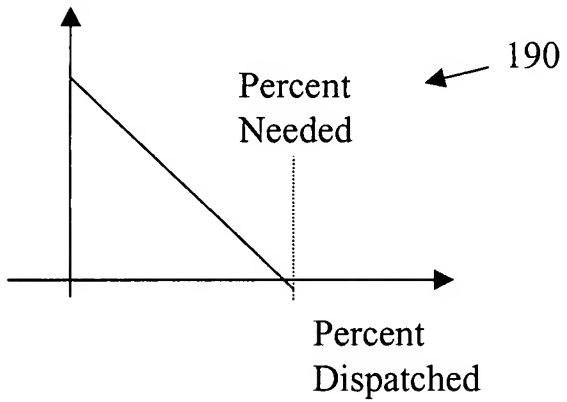
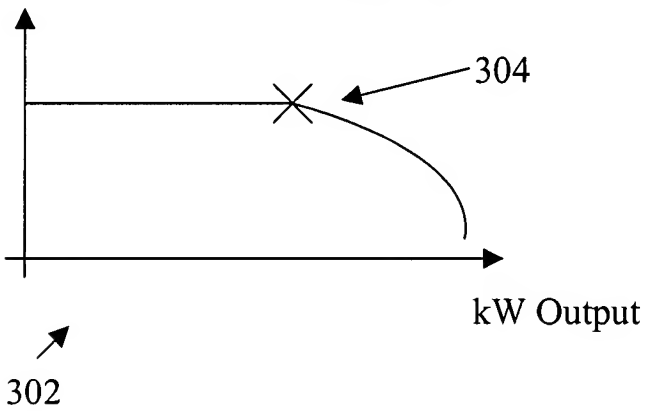


FIG. 16



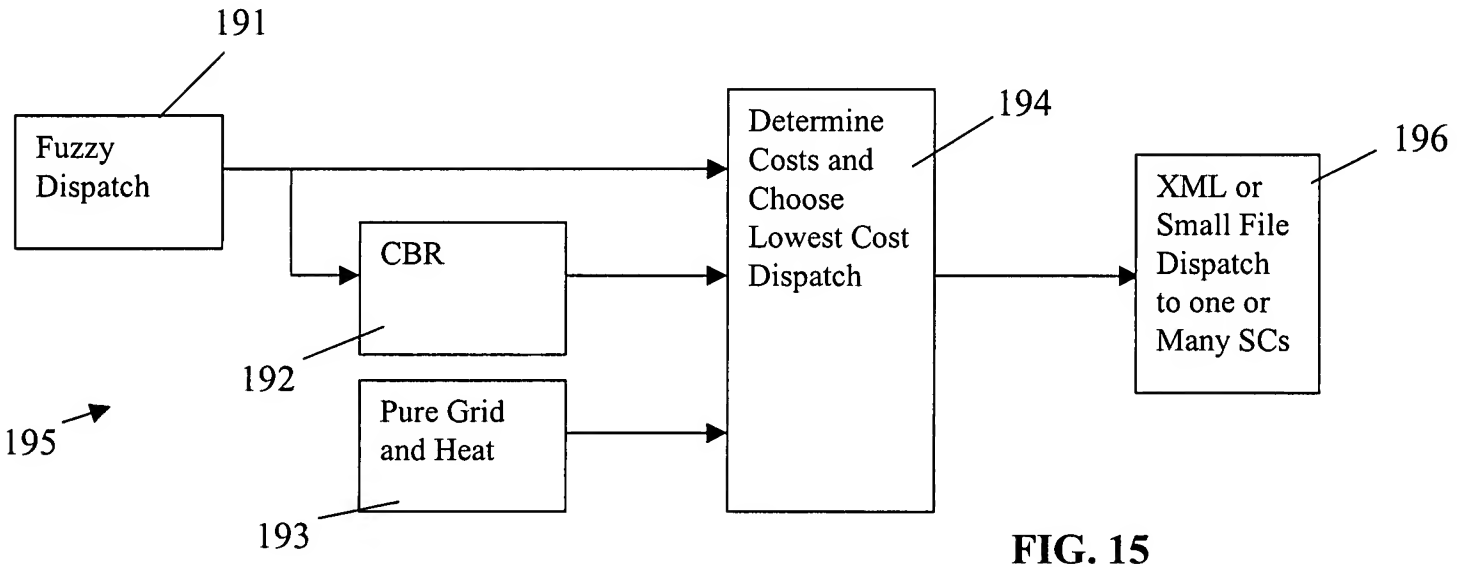
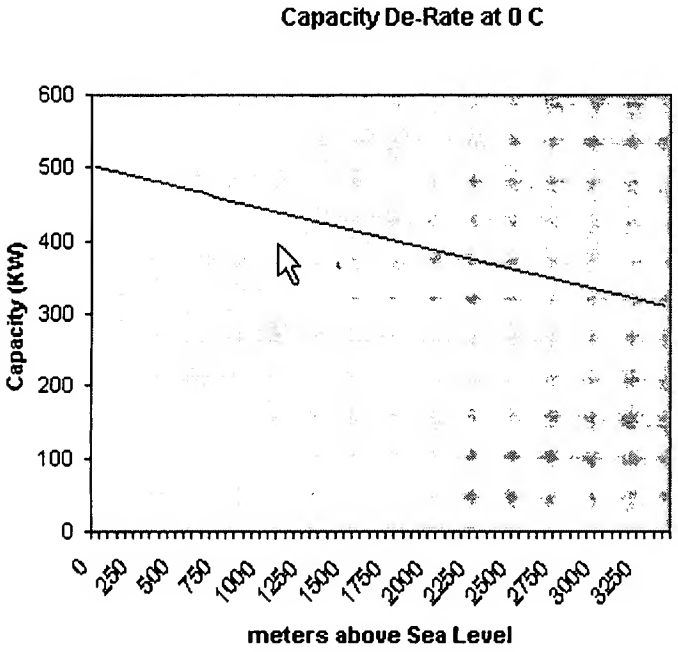


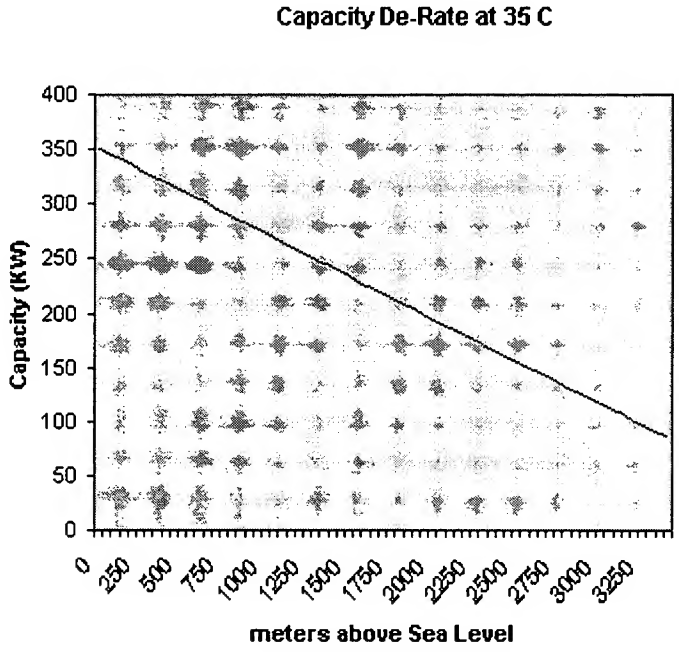
FIG. 15

FIG. 17A



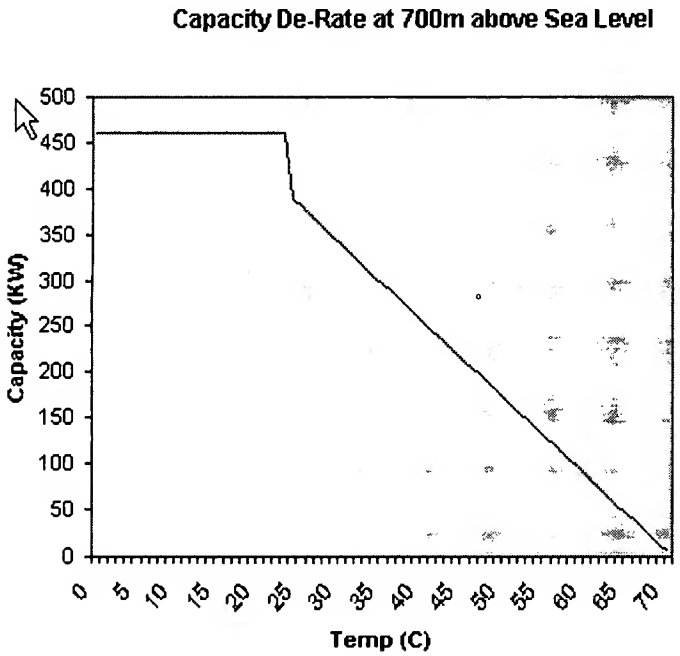
310

FIG. 17B



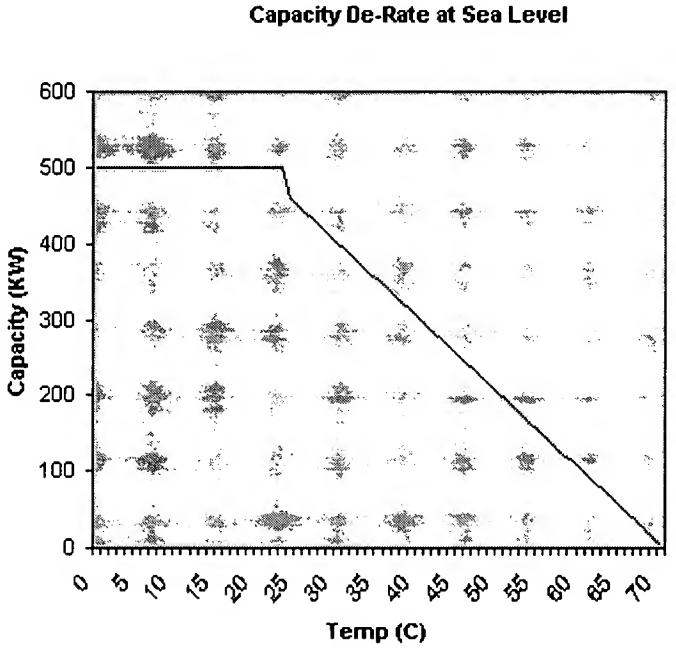
312

FIG. 17C



314

FIG. 17D



316

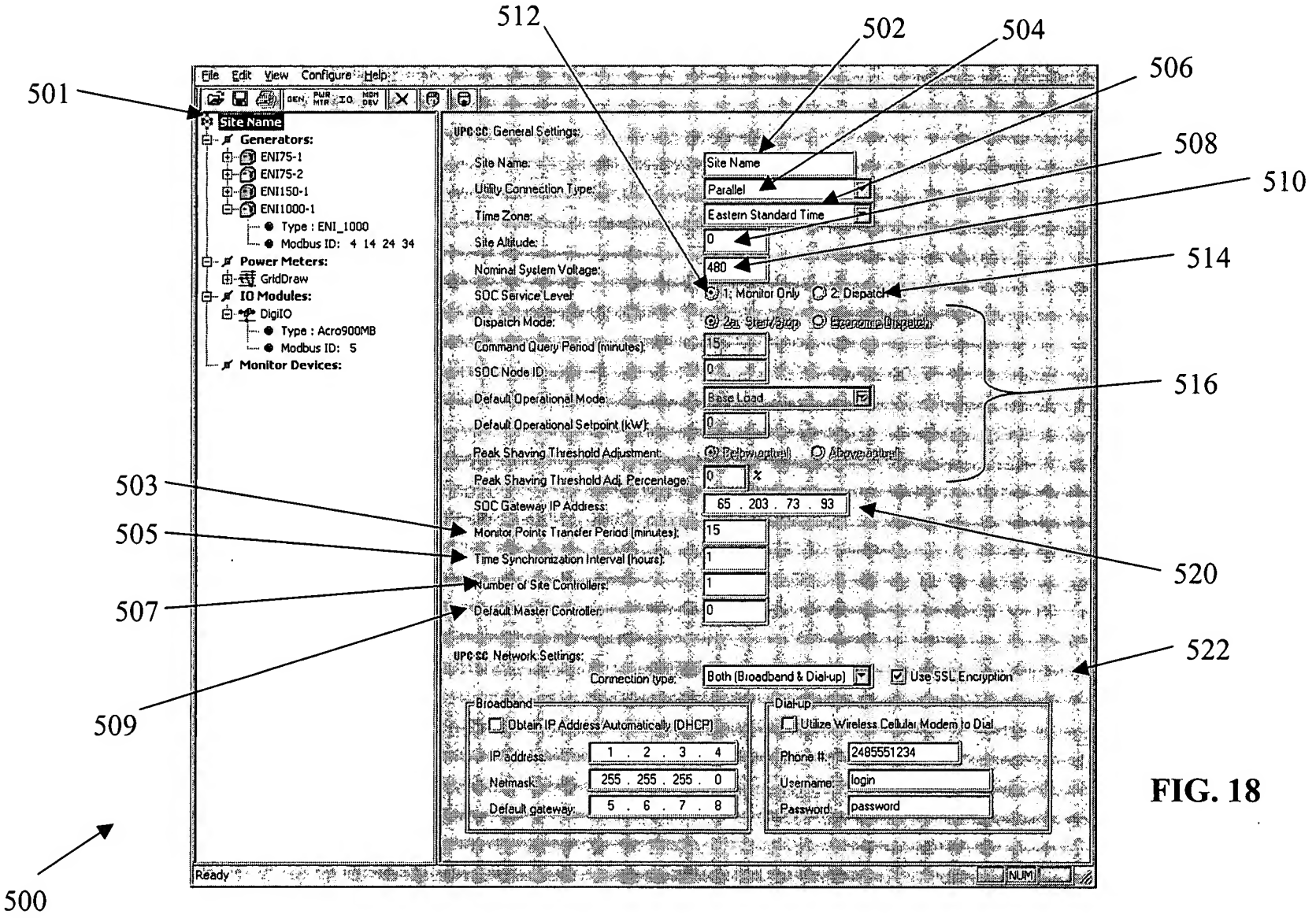

512
502
504
506
501
508
510
514
516
503
505
507
509
520
522
500
File Edit View Configure Help
Site Name
Generators:
ENI75-1
ENI75-2
ENI150-1
ENI1000-1
Type : ENI_1000
Modbus ID: 4 14 24 34
Power Meters:
GridDraw
IO Modules:
DigiIO
Type : Acro900MB
Modbus ID: 5
Monitor Devices:
UPC SC General Settings:
Site Name:
Site Name
Utility Connection Type:
Parallel
Time Zone:
Eastern Standard Time
Site Altitude:
0
Nominal System Voltage:
480
SOC Service Level:
1: Monitor Only
2: Dispatch
Dispatch Mode:
2a: Start/Stop
Economic Dispatch
Command Query Period (minutes):
15
SOC Node ID:
0
Default Operational Mode:
Base Load
Default Operational Setpoint (kW):
0
Peak Shaving Threshold Adjustment:
Below natural
Above natural
Peak Shaving Threshold Adj. Percentage:
0
%
SOC Gateway IP Address:
65 . 203 . 73 . 93
Monitor Points Transfer Period (minutes):
15
Time Synchronization Interval (hours):
1
Number of Site Controllers:
1
Default Master Controller:
0
UPC SC Network Settings:
Connection type:
Both (Broadband & Dial-up)
Use SSL Encryption
Broadband
Obtain IP Address Automatically (DHCP)
IP address:
1 . 2 . 3 . 4
Netmask:
255 . 255 . 255 . 0
Default gateway:
5 . 6 . 7 . 8
Dial-up
Utilize Wireless Cellular Modem to Dial
Phone #:
2485551234
Username:
login
Password:
password
Ready
NUM

FIG. 18

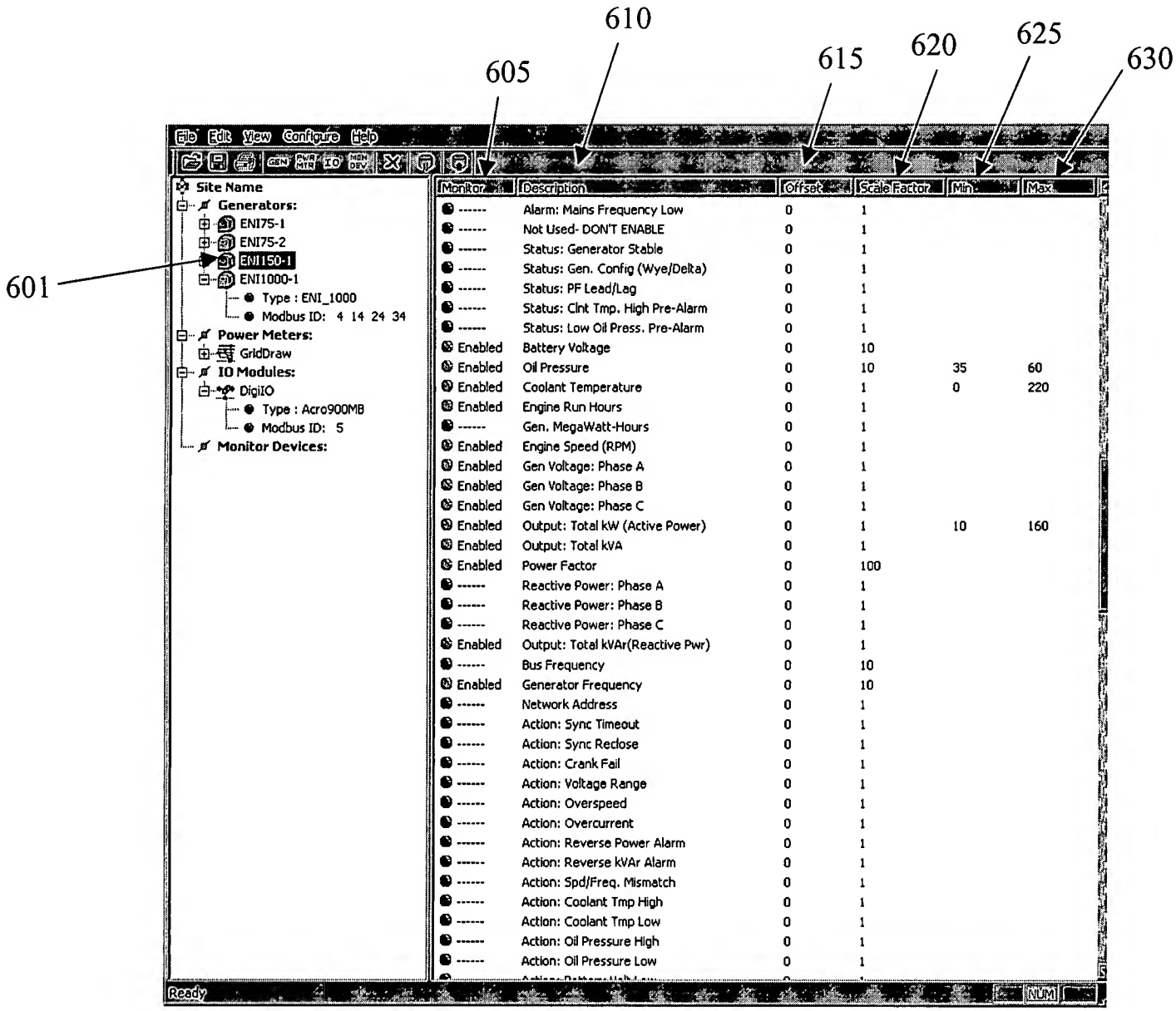

610
605
615
620
625
630
601
600
File Edit View Configure Help
Site Name
Generators:
ENI75-1
ENI75-2
ENI150-1
ENI1000-1
Type : ENI_1000
Modbus ID: 4 14 24 34
Power Meters:
GridDraw
IO Modules:
DigiIO
Type : Acro900MB
Modbus ID: 5
Monitor Devices:
Monitor
Description
Offset
Scale Factor
Min
Max
------ Alarm: Mains Frequency Low 0 1
------ Not Used- DON'T ENABLE 0 1
------ Status: Generator Stable 0 1
------ Status: Gen. Config (Wye/Delta) 0 1
------ Status: PF Lead/Lag 0 1
------ Status: Clnt Tmp. High Pre-Alarm 0 1
------ Status: Low Oil Press. Pre-Alarm 0 1
Enabled Battery Voltage 0 10
Enabled Oil Pressure 0 10 35 60
Enabled Coolant Temperature 0 1 0 220
Enabled Engine Run Hours 0 1
------ Gen. MegaWatt-Hours 0 1
Enabled Engine Speed (RPM) 0 1
Enabled Gen Voltage: Phase A 0 1
Enabled Gen Voltage: Phase B 0 1
Enabled Gen Voltage: Phase C 0 1
Enabled Output: Total kW (Active Power) 0 1 10 160
Enabled Output: Total kVA 0 1
Enabled Power Factor 0 100
------ Reactive Power: Phase A 0 1
------ Reactive Power: Phase B 0 1
------ Reactive Power: Phase C 0 1
Enabled Output: Total kVAr(Reactive Pwr) 0 1
------ Bus Frequency 0 10
Enabled Generator Frequency 0 10
------ Network Address 0 1
------ Action: Sync Timeout 0 1
------ Action: Sync Reclose 0 1
------ Action: Crank Fail 0 1
------ Action: Voltage Range 0 1
------ Action: Overspeed 0 1
------ Action: Overcurrent 0 1
------ Action: Reverse Power Alarm 0 1
------ Action: Reverse kVAr Alarm 0 1
------ Action: Spd/Freq. Mismatch 0 1
------ Action: Coolant Tmp High 0 1
------ Action: Coolant Tmp Low 0 1
------ Action: Oil Pressure High 0 1
------ Action: Oil Pressure Low 0 1
Ready
NUM

FIG. 19

FIG. 20

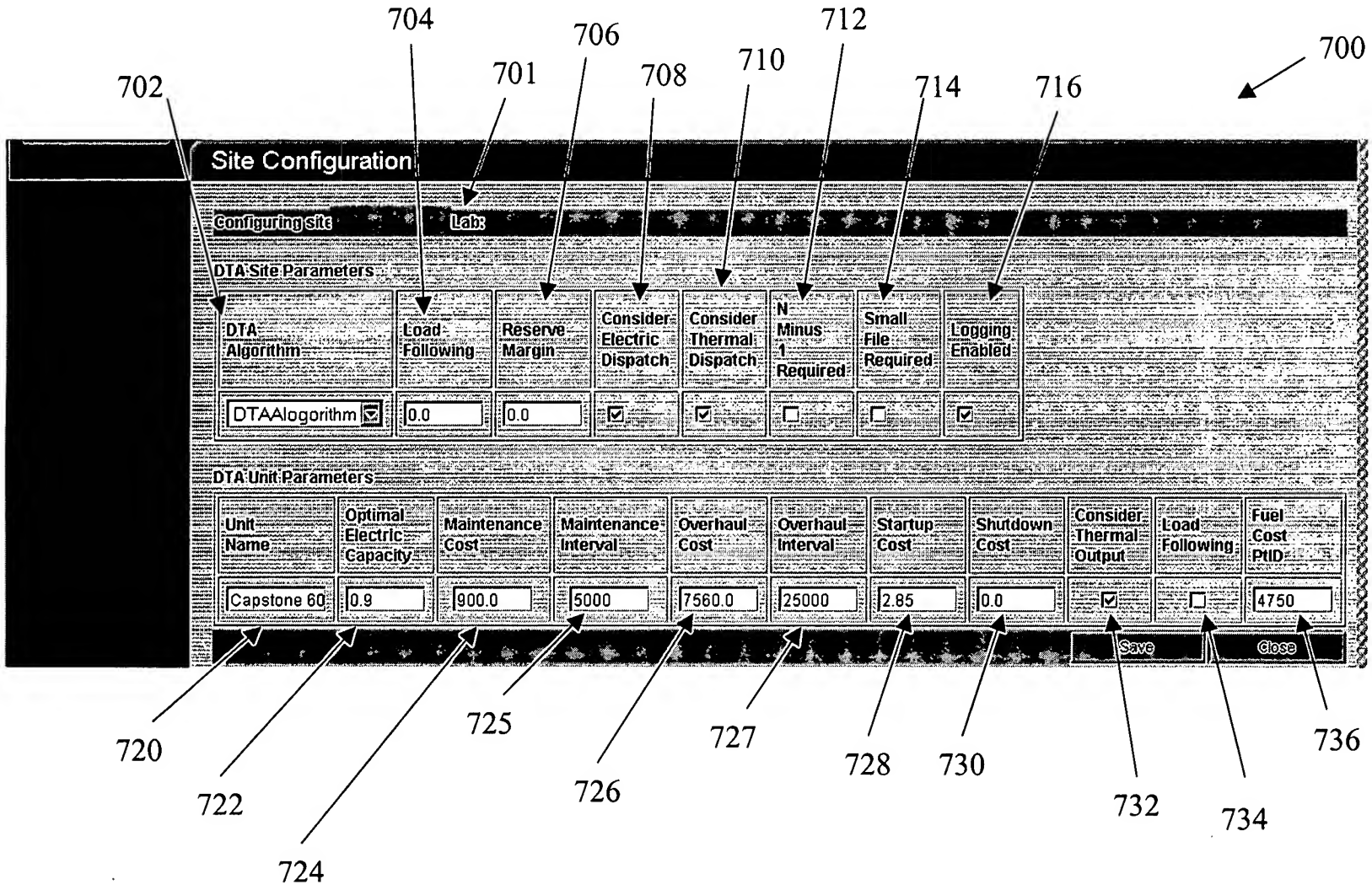

700
701
702
704
706
708
710
712
714
716
Site Configuration
Configuring site
Lab:
DTA Site Parameters
DTA Algorithm
Load Following
Reserve Margin
Consider Electric Dispatch
Consider Thermal Dispatch
N Minus 1 Required
Small File Required
Logging Enabled
DTAAlogorithm
0.0
0.0
DTA Unit Parameters
Unit Name
Optimal Electric Capacity
Maintenance Cost
Maintenance Interval
Overhaul Cost
Overhaul Interval
Startup Cost
Shutdown Cost
Consider Thermal Output
Load Following
Fuel Cost PtID
Capstone 60
0.9
900.0
5000
7560.0
25000
2.85
0.0
4750
Save
Close
720
722
724
725
726
727
728
730
732
734
736

FIG. 21

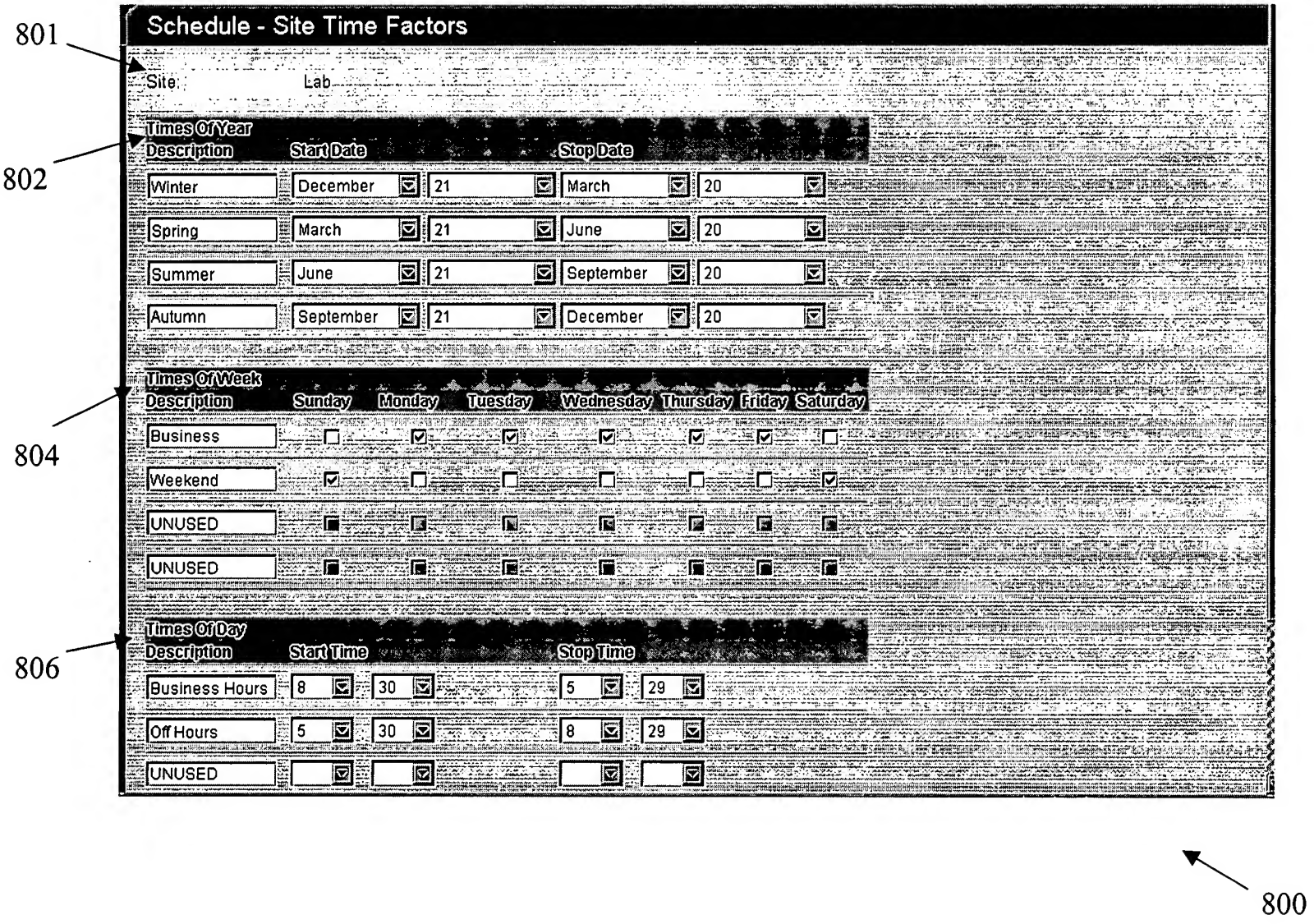
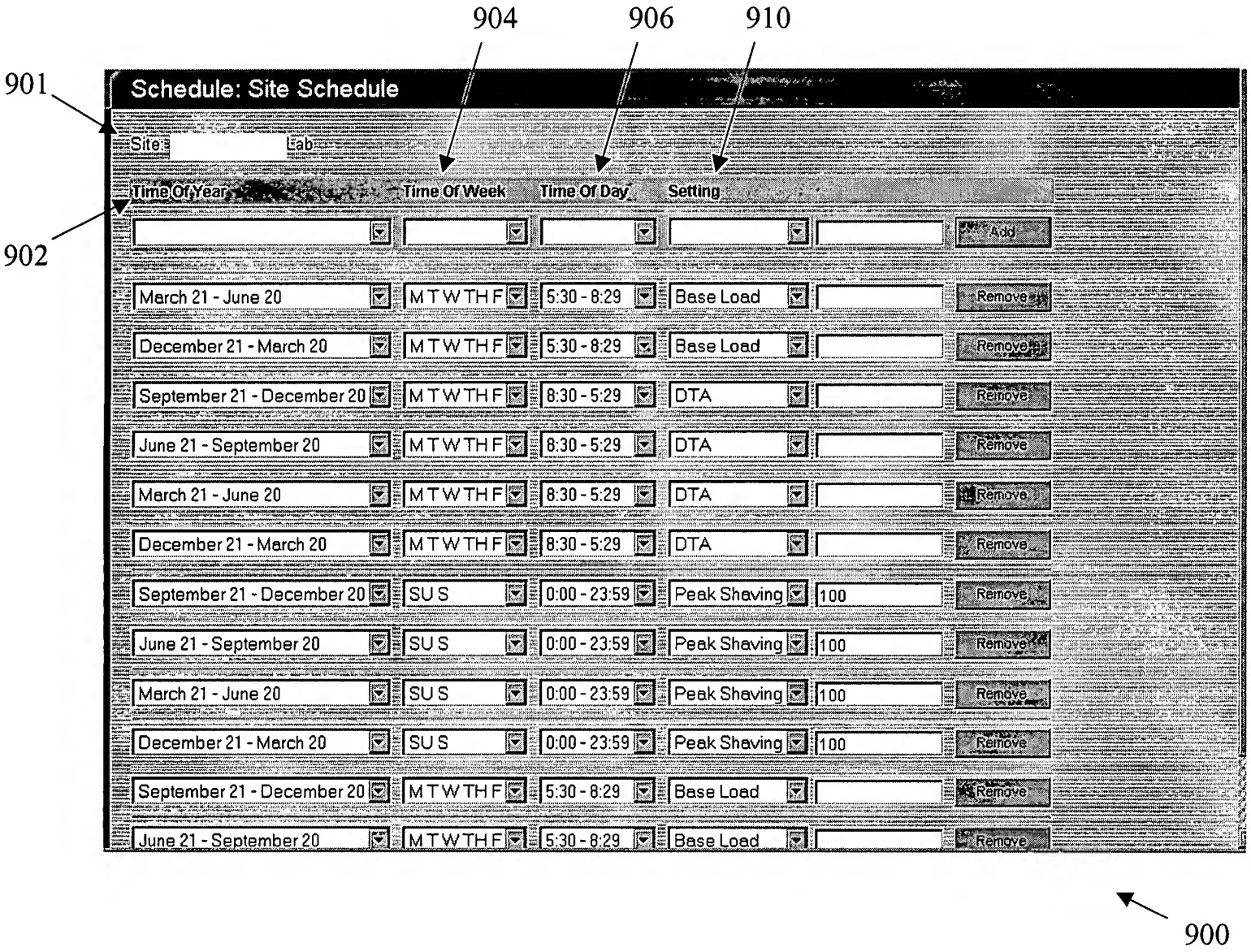

801
802
804
806
800
Schedule - Site Time Factors
Site: Lab
Times Of Year
Description Start Date Stop Date
Winter December 21 March 20
Spring March 21 June 20
Summer June 21 September 20
Autumn September 21 December 20
Times Of Week
Description Sunday Monday Tuesday Wednesday Thursday Friday Saturday
Business
Weekend
UNUSED
UNUSED
Times Of Day
Description Start Time Stop Time
Business Hours 8 30 5 29
Off Hours 5 30 8 29
UNUSED

FIG. 22


901
902
904
906
910
900
Schedule: Site Schedule
Site:
Lab
Time Of Year
Time Of Week
Time Of Day
Setting
Add
March 21 - June 20
M T W TH F
5:30 - 8:29
Base Load
Remove
December 21 - March 20
M T W TH F
5:30 - 8:29
Base Load
Remove
September 21 - December 20
M T W TH F
8:30 - 5:29
DTA
Remove
June 21 - September 20
M T W TH F
8:30 - 5:29
DTA
Remove
March 21 - June 20
M T W TH F
8:30 - 5:29
DTA
Remove
December 21 - March 20
M T W TH F
8:30 - 5:29
DTA
Remove
September 21 - December 20
SU S
0:00 - 23:59
Peak Shaving
100
Remove
June 21 - September 20
SU S
0:00 - 23:59
Peak Shaving
100
Remove
March 21 - June 20
SU S
0:00 - 23:59
Peak Shaving
100
Remove
December 21 - March 20
SU S
0:00 - 23:59
Peak Shaving
100
Remove
September 21 - December 20
M T W TH F
5:30 - 8:29
Base Load
Remove
June 21 - September 20
M T W TH F
5:30 - 8:29
Base Load
Remove